SAFETY SUPPLEMENT

TECHNICAL MANUAL

AEROSPACE EMERGENCY RESCUE AND MISHAP RESPONSE INFORMATION (EMERGENCY SERVICES)

THIS PUBLICATION SUPPLEMENTS TO 00-105E-9 REVISION 8, DATED 30 SEPTEMBER 2002, LOCATED AT WEB SITE:**http://www.robins.af.mil/logistics/LGEDA/Documents/to00-105e-9.htm**.

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23 January 2004

71. PURPOSE.

This supplement provides instructions for update of TO 00-105E-9 Revision 8, dated 30 September 2002, affecting Chapter 10 USAF Observation/Reconnaisance Aircraft. This update adds new information regarding the Unmanned Aircraft Vehicle RQ-1/MQ-1L Predator/-Hunter/Killer procedures with information regarding associated hazards.

2. INSTRUCTIONS.

a. This information, if it applies to your operation, can be downloaded and printed from this web site by the end user. Use the most current Adobe Reader for this function. This software is free and can be downloaded from Adobe.com at their web site. PDF files should be downloaded with the Reader running on your PC to reduce download time.

b. This supplement to Chapter 10 adds information based on newly researched source data information regarding the two variations of this UAV. The new update should be added to Chapter 10 in TO 00-105E-9 Revison 8. The end user should save this file and print the affected pages, if applicable to the user's operation. File a copy of this Safety Supplement with the main Technical Order according to current regulations.

NOTE

The operational user file is the whole or selected printed pages from the web site placed in a binder used for local, transient operations or both. This information should also be included in mobility boxes where applicable. If your unit or a part of your unit is serving elsewhere, they should be informed of this Safety Supplement and how to obtain it. See TO 00-5-2 paragraphs 1-1.4,1-1.4.1, and 1-1.6 for Local Reproduction of TOs and Digital Media guidance.

THE END

UAV PAINT SCHEMES

RQ-1 PREDATOR

MQ-1 HUNTER/KILLER

UAV GENERAL INFORMATION

RQ-1/MQ-1

The purpose of this UAV file is to inform Emergency Services and aircraft recovery personnel of the description, hazards, subsystems, materials, shutdown procedures, and weapons associated with this Unmanned Aerial Vehicle (UAV) system.

The RQ-1 “Predator” is a Medium Altitude Endurance (MEA) UAV. The MQ-1 “Hunter/Killer” UAV has the additional capacity to support AGM-114 missiles.

The UAV is a mid-wing monoplane with a slender fuselage housing, the payload and fuel, a high aspect ratio wing, and inverted-V tails.

The UAV is powered by a four cylinder Rotax engine requiring 100 octane aviation fuel type 110 LL Avgas with a capacity of 405 litres.

The primary function is video reconnaissance accessing battle damage and battlefield chaos for intelligence planners.

The Predator system is composed of three parts: the air vehicle with its associated sensors and communications equipment, the ground control station (GCS), and the product or data dissemination system. One Predator system has four air vehicles with sensors and data links, one GCS, and one Trojan Spirit II SATCOM system. SATCOM (or Predator Primary Satellite Link (PPSL)). Predator missions do not employ support aircraft.

The sensors include an electro-optic/infared (EO/IR) payload Skyball with a zoom lens and a spotter lens, and a Northrop Grumman/Westinghouse Tactical Endurance Synthetic Aperture Radar (TESAR) and other detection system payloads. The MQ-1 UAV may also carry the AN/AAS-52(V)1 infrared detecting set.

In addition, the MQ-1 may also carry two AGM-114 missiles.

The UAV has a Ku-band satellite data link to provide over-the-horizon mission capabilities.

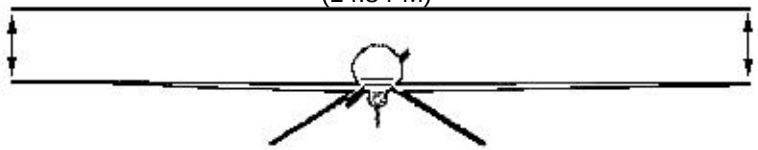
The RQ-1 has installed deicing equipment.

RQ-1 PREDATOR

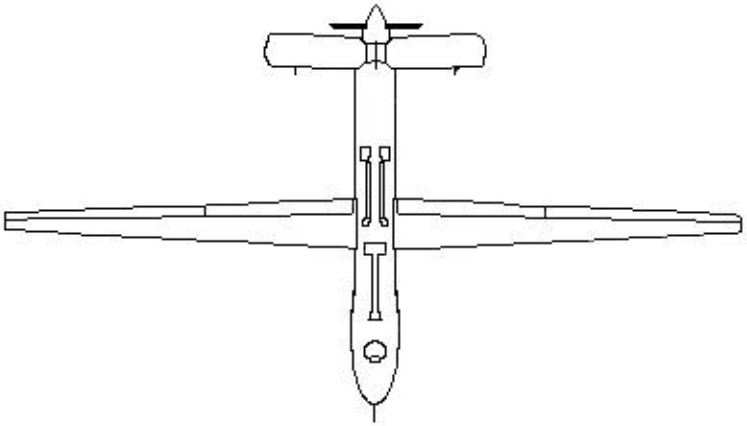
MQ-1 HUNTER/KILLER

RQ-1 UAV SPECIFICATIONS

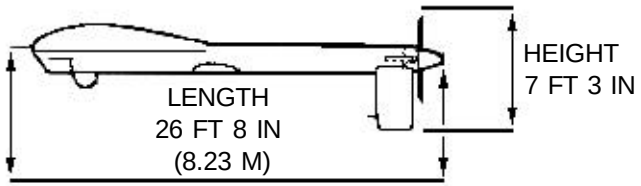
Performance:	
Altitude	25,000 FT (7,620 M) or less
Range	1200 nautical miles
Cruise Speed	>70 kts
Endurance	>40 hrs
Conventional launch and recovery	approx. 2000 FT (600 M)
Weights:	
Weight fully loaded	<2300 LB (1035 KG)
Weight payload	450 LB (202.5 KG)
Payload	450 LB (204 KG)
Electro-optical payloads:	
2 colour DLTV television	Variable zoom, 955 mm Spotter
High resolution FLIR	6 field of view, 19 to 560 MM
Synthetic Aperture Radar	all weather surveillance, 1 FT resolution
Optional payloads	Laser target designator and rangefinder, ECM/ESM, moving target indicator, communications relay
Datalinks:	C-band LOS and Ku Band Satellite
Radio Relay	UHFand VHF radio
Data distribution system	Trojan Spirit II or Global Broadcast System for dissemination
Vehicles:	2 HMMWV Transports
Ground data	5.5 M dish for Ku-band Ground Data Terminal
Data dissemination	2.4 M dish for data dissemination
Ground Control Station:	
Trailer	30 FT x 8 FT x 8 FT (9.14 M x 2.44 M x 2.44 M)
Air transportability	C-130 and C-141 transportable



FORWARD VIEW



BOTTOM VIEW



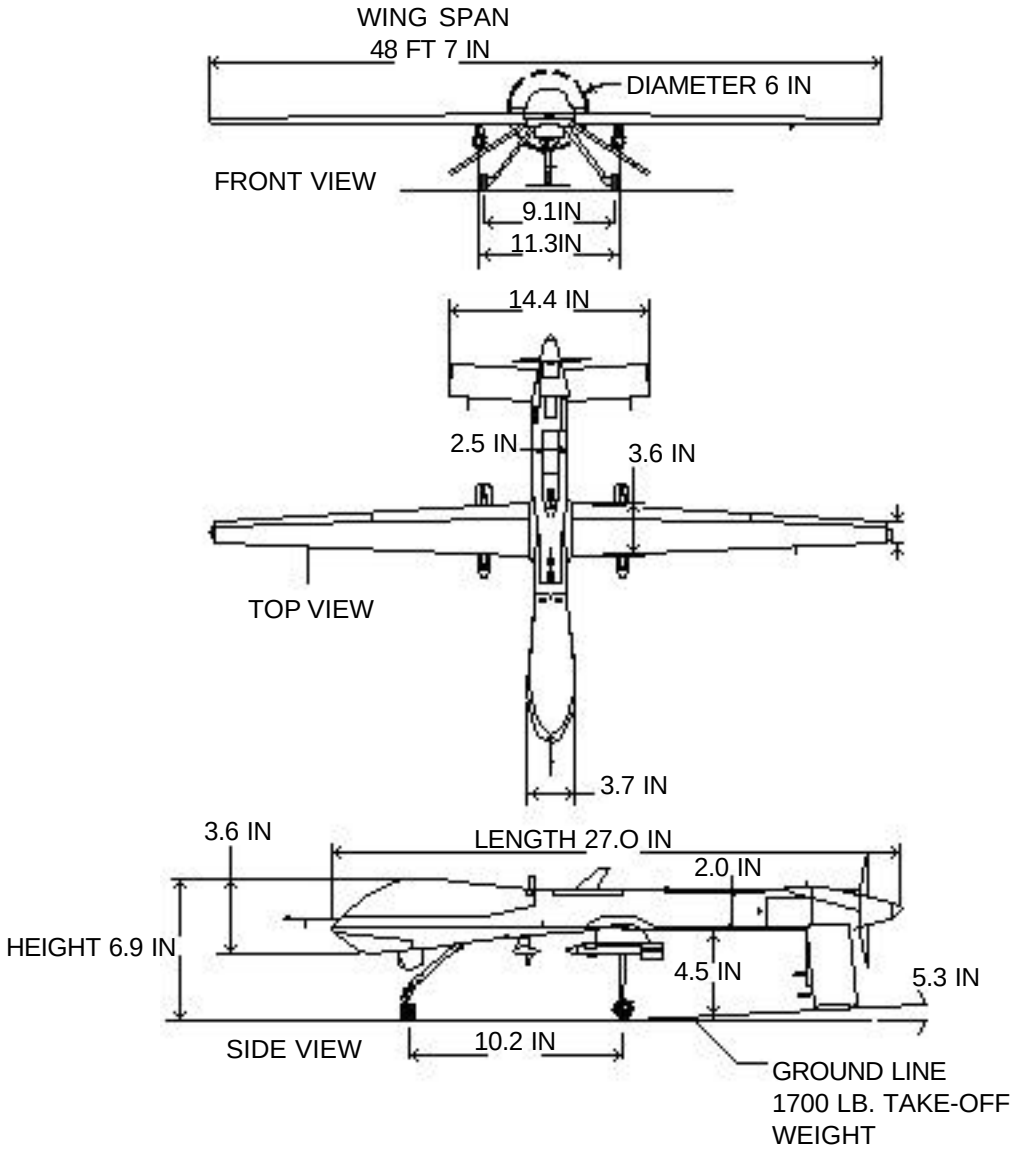
SIDE VIEW

MQ-1 UAV SPECIFICATIONS

RQ-1 Weights:

Maximum Ramp Weight:	2250 lb.
Empty Operating Weight	
Without Anti-Ice System	1680 lb.
With Anti-Ice System	1760 lb.
Basic Airframe Weight	
Without Anti-Ice System	1130 lb.
With Anti-Ice System	1210 lb.
Fuel Weight (Full Tanks 640±20)	660 lb.
Maximum De-Icing Fluid	68 lb.
MQ-1 Additional Weight:	
With AGM-114 (2)	2452

Data distribution system: T rojan Spirit II or Predator Primary Satellite Link (PPSL)



UAV STRUCTURAL MATERIALS

1. STRUCTURAL MATERIALS

ALUMINUM/STEEL

COMPOSITE

TITANIUM

a. Composite percentage is 92%. The outer fuselage is made of composite material consisting of carbon fiber and Kevlar, with quartz fiber. The vehicle is mainly a sandwich laminate structure. Core materials are Nomex, foam and wood. Fabric is predominately face layers for the sandwiched laminates. The landing gear is made from carbon fiber fabric layers. Interal support structures are made from carbon fiber unidirectional tape. Fibers are carbon and glass. The general material - carbon and glass fiber foam, Nomex and wood.

b. The EO/IR Sensor is mostly composed of aluminum and glass. See page 7, item 27.

c. The leading edges of the wings and tails are titanium where microscopic holes weep ethylene glycol deicing fluid.

d. The internal support structures, on page 7, the bulkheads at 6, 7 and 13, are aluminum.

e. The landing gear legs are composite, with aluminum and steel mechanisms at the top and bottom.

f. The wheels are aluminum.

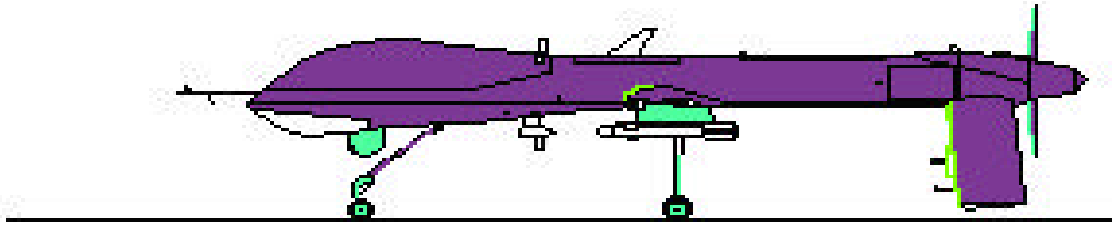
g. The engine is aluminum and steel.

h. The avionics boxes, inside the fuselage are mostly aluminum, usually housing plastic and copper circuit boards.

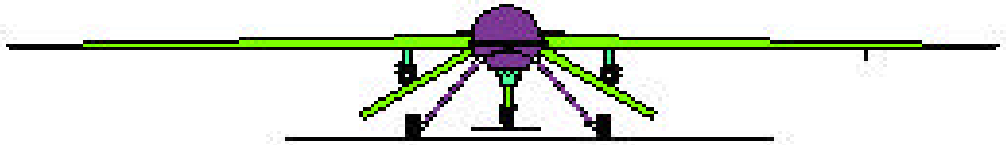
i. The batteries are nickle-cadium (Ni-Cad).

j. Fuel cells are made of a rubberized fabric. See page 8 items 9 and 10.

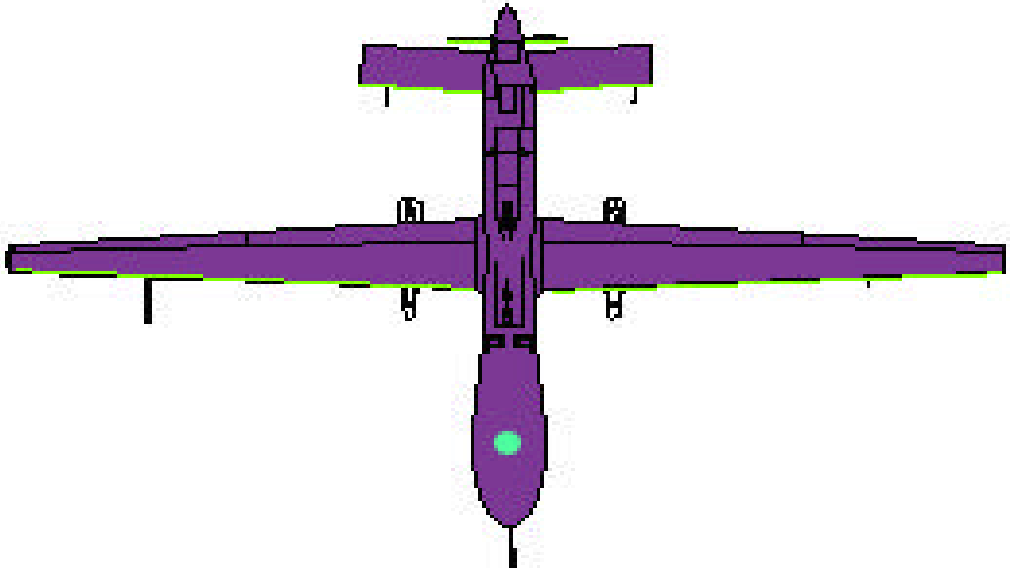
k. The AGM-114 weapon pylons are made of aluminum.



LEFT SIDE VIEW



FRONT VIEW

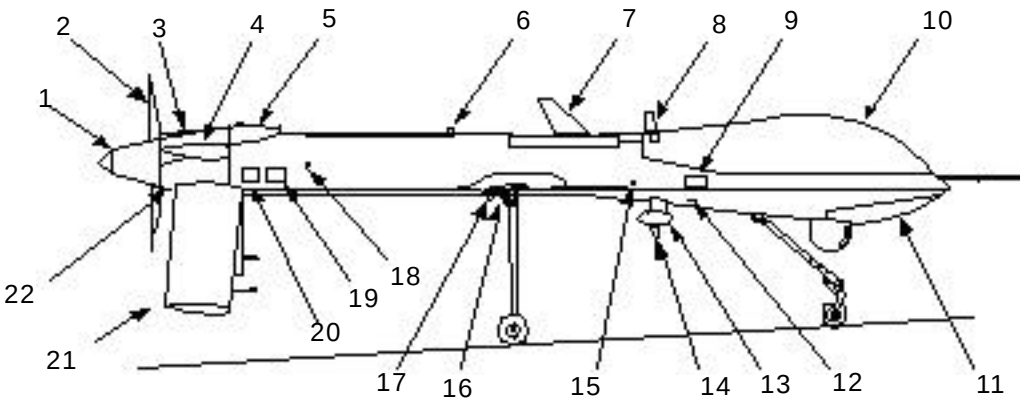


BOTTOM VIEW

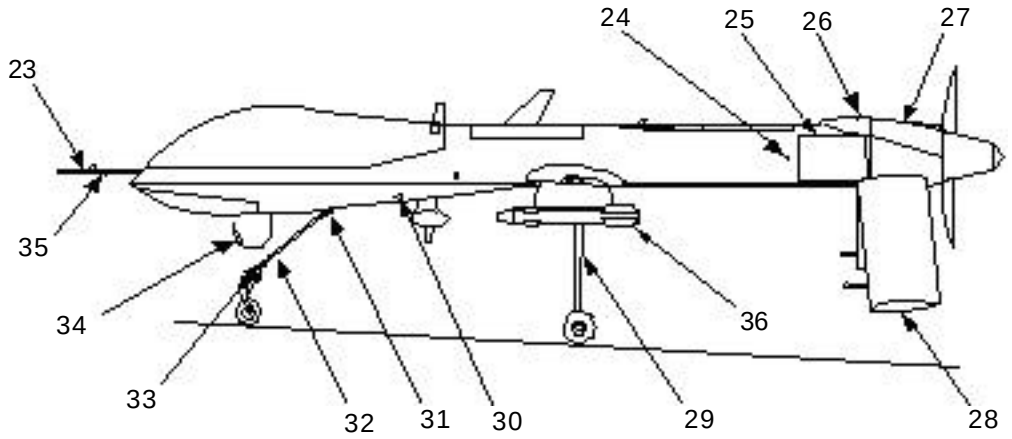
UAV EXTERNAL FEATURES

1. SPINNER ASSEMBLY
2. VARIABLE PITCH PROPELLER ASSEMBLY
3. COWL FLAP
4. AIR INLET TUBE FAIRING
5. COOLING DUCT COVER ASSEMBLY
6. UPPER APX-100 IDENTIFICATION FRIEND OR FOE ANTENNA
7. ULTRA HIGH FREQUENCY/VERY HIGH FREQUENCY ARC210 ANTENNA
8. C-BAND UPPER OMNIDIRECTIONAL ANTENNA
9. GLOBAL POSITIONING SYSTEM TEST PANEL ACCESS
10. KU SATELLITE COMMUNICATIONS RADOME ASSEMBLY
11. SYNTHETIC APERTURE RADAR RADOME/NON-RADIO FREQUENCY COVER
12. FRONT AVIONICS BAY COOLING AIR INLET
13. C-BAND DIRECTIONAL ANTENNA
14. C-BAND LOWER OMNIDERECTIONAL ANTENNA
15. ENGINE KILL SWITCH
16. MAIN LANDING GEAR RETRACT ASSEMBLY
17. LOWER APX-100 IDENTIFICATION FRIEND OR FOE ANTENNA
18. HEATED STATIC PORT (RIGHT)
19. GROUND POWER PANEL ACCESS
20. NETWORK JUNCTION BOARD PRINTED WIRE ASSEMBLY PANEL
21. RIGHT TAIL ASSEMBLY
22. LOWER ENGINE COWL ASSEMBLY
23. ALPHA PROBE ASSEMBLY
24. HEATED STATIC PORT (LEFT)
25. POWERBAY PANEL
26. RED WARNING STROBE LIGHT
27. UPPER ENGINE DOWL ASSEMBLY
28. LEFT TAIL ASSEMBLY
29. MAIN LANDING GEAR
30. FRONT AVIONICS BAY COOLING AIR INLET
31. NOSE LANDING GEAR RETRACT ASSEMBLY
32. NOSE LANDING GEAR
33. NOSE WHEEL AND SHOCK
34. ELECTRO-OPTICAL/INFRARED SENSOR/AN/AAS-52(V)1
35. YAW STRING
36. AGM-114 PYLON, RAIL, AND MISSLE (LT SIDE SHOWN, RT SIDE NOT SHOWN) (MQ-1 ONLY)

RIGHT SIDE



RIGHT PYLON REMOVED FOR CLARITY



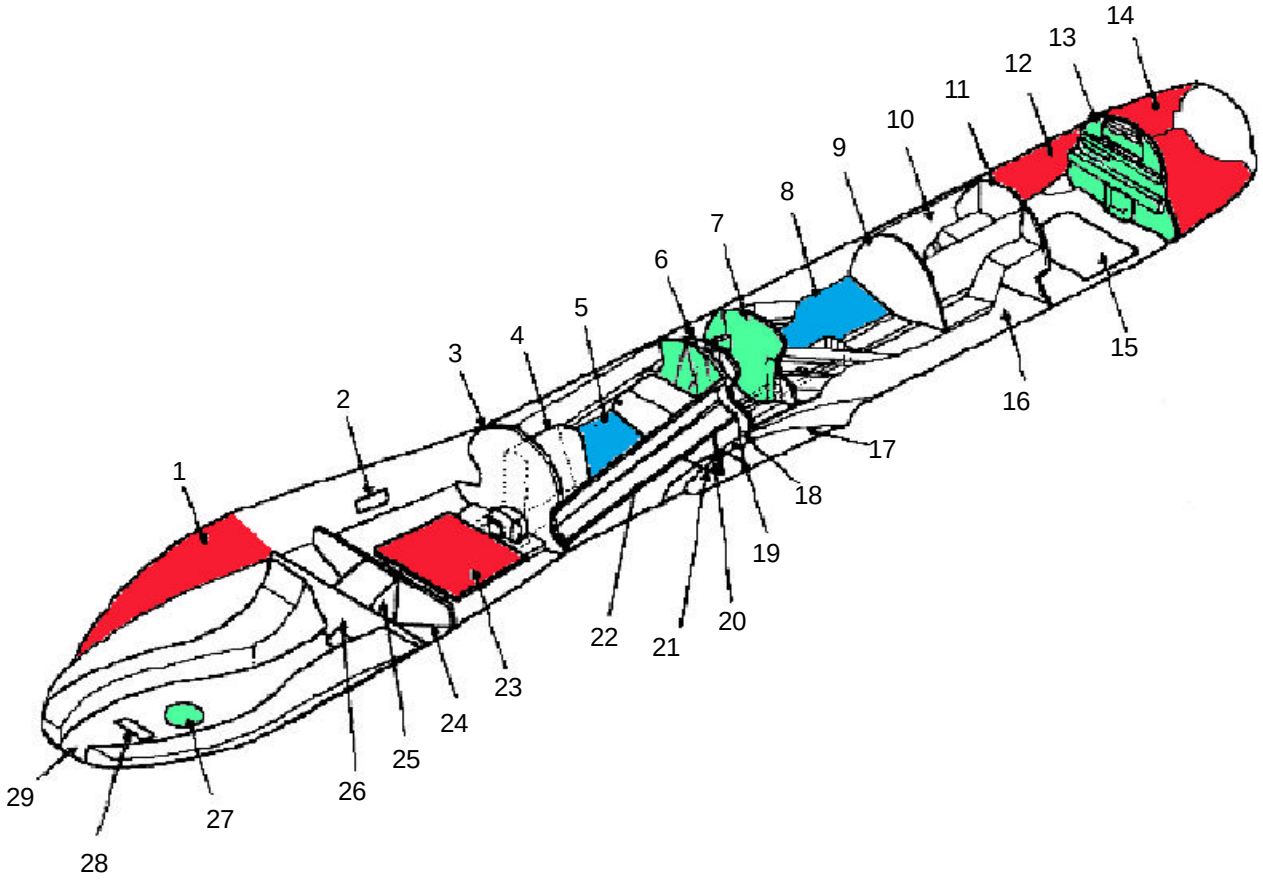
LEFT SIDE

UAV INTERNAL FEATURES

NOTE:

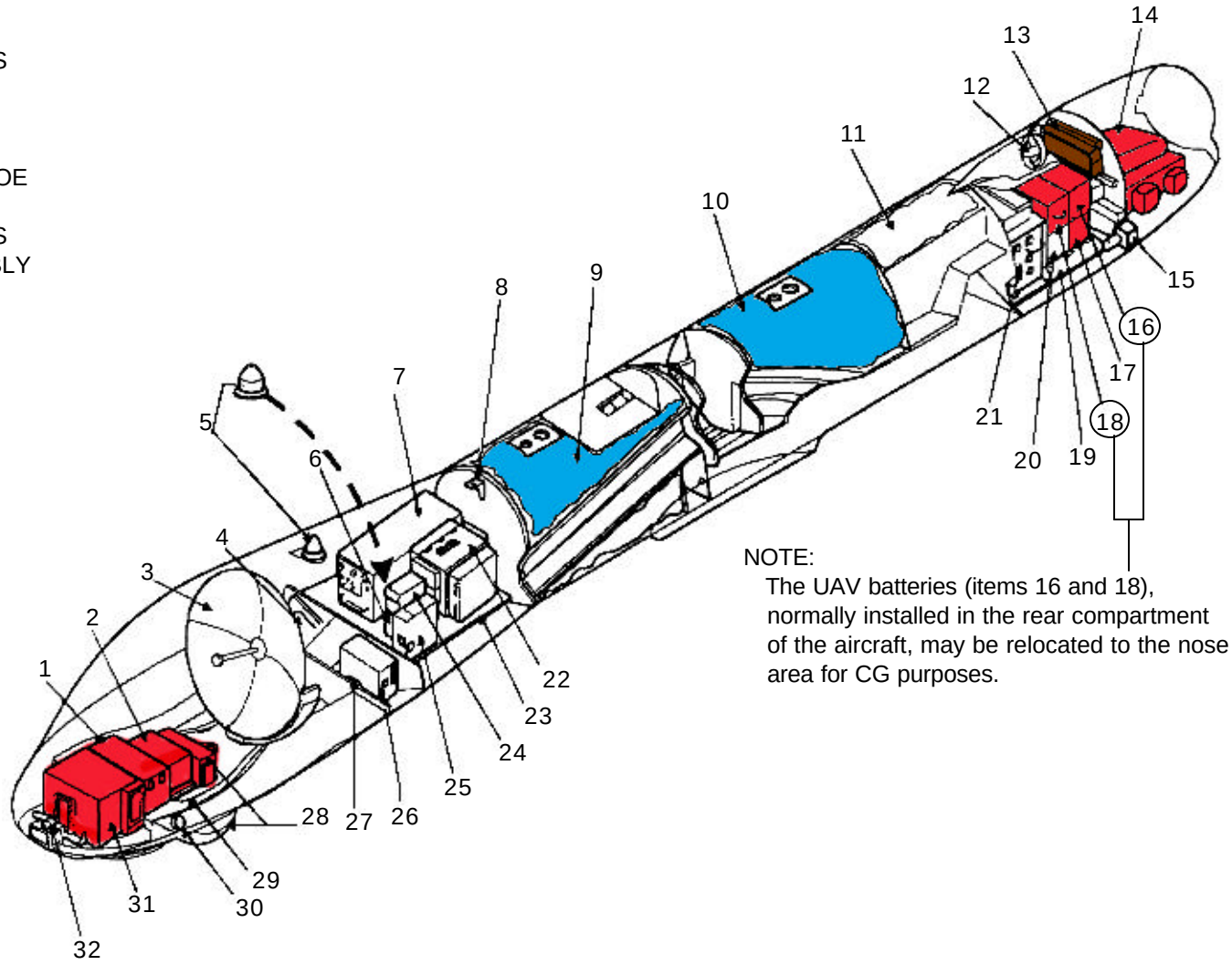
The fuselage is a semimonocoque composite structure.
Bulkhead in the middle support the wings.

1. FRONT AVIONICS BAY
2. GPS TEST PANEL ACCESS
3. BULKHEAD 3
4. NOSE LANDING GEAR BAY
5. FORWARD FUEL CELL BAY
6. BULKHEAD 6 (ALUMINUM)
7. BULKHEAD 7(ALUMINUM)
8. AFT FUEL CELL BAY
9. BULKHEAD 8
10. ACCESSORY BAY
11. BULKHEAD 9
12. POWERBAY
13. BULKHEAD 10 (ALUMINUM)
14. ENGINE BAY
15. AFT EQUIPMENT BAY TRAY
16. MAIN LANDING GEAR BAY
17. WING FILLET
18. MAIN LANDING GEAR ATTACHMENT
19. BULKHEAD 5
20. WING SPAR ATTACHMENT POINTS
21. BULKHEAD 4
22. CABLE CONDUIT
23. FRONT AVIONIC BAY TRAY
24. BULKHEAD 2
25. NOSE LANDING GEAR BAY PROTRUSION
26. BULKHEAD 1
27. OPENING FOR ELECTRO-OPTICAL/ INFRARED SENSOR (ALUMINUM/GLASS) OR AN-AAS-52(V)1
28. OPENING FOR SAR ANTENNA ASSEMBLY
29. FRONT BAY PAYLOAD TRAY



UAV INTERNAL FEATURES-Continued

1. SYNTHETIC APERTURE RADAR ANTENNA
2. INERTIAL NAVIGATION SYSTEM/GPS
3. KU-BAND SATELLITE COMMUNICATIONS ANTENNA
4. VIDEO CASSETTE RECORDER
5. GPS ANTENNAS (LEFT AND RIGHT)
6. APX-100 IDENTIFICATION FRIEND OR FOE TRANSPONDER
7. KU-BAND SATELLITE COMMUNICATIONS SENSOR PROCESSOR MODEM ASSEMBLY
8. C-BAND UPPER OMNIDIRECTIONAL ANTENNA BRACKET
9. FORWARD FUEL CELL ASSEMBLY
10. AFT FUEL CELL ASSEMBLY
11. ACCESSORY BAY
12. ENGINE COOLING FAN
13. OIL COOLER/RADIATOR
14. 914F ENGINE
15. TAIL SERVO (LEFT AND RIGHT)
16. BATTERY ASSEMBLY #2
17. POWER SUPPLY
18. BATTERY ASSEMBLY #1
19. AFT EQUIPMENT BAY TRAY
20. SECONDARY CONTROL MODULE
21. SYNTHETIC APERTURE RADAR PROCESSOR/AGM-114 ELECTRONICS ASSEMBLY
22. PRIMARY CONTROL MODULE
23. FRONT BAY AVIONICS TRAY
24. ARC-210 RECEIVER/TRANSMITTER
25. FLIGHT SENSOR UNIT
26. VIDEO ENCODER
27. DE-ICE CONTROLLER
28. ELECTRO-OPTICAL/INFRARED SENSOR/ AN/AAS-52(V)1 ELETRONICS ASSEMBLY
29. FRONT BAY PAYLOAD TRAY
30. ICE DETECTOR
31. SYNTHETIC APERTURE RADAR (SAR) RECEIVER/TRANSMITTER
32. NOSE CAMERA ASSEMBLY



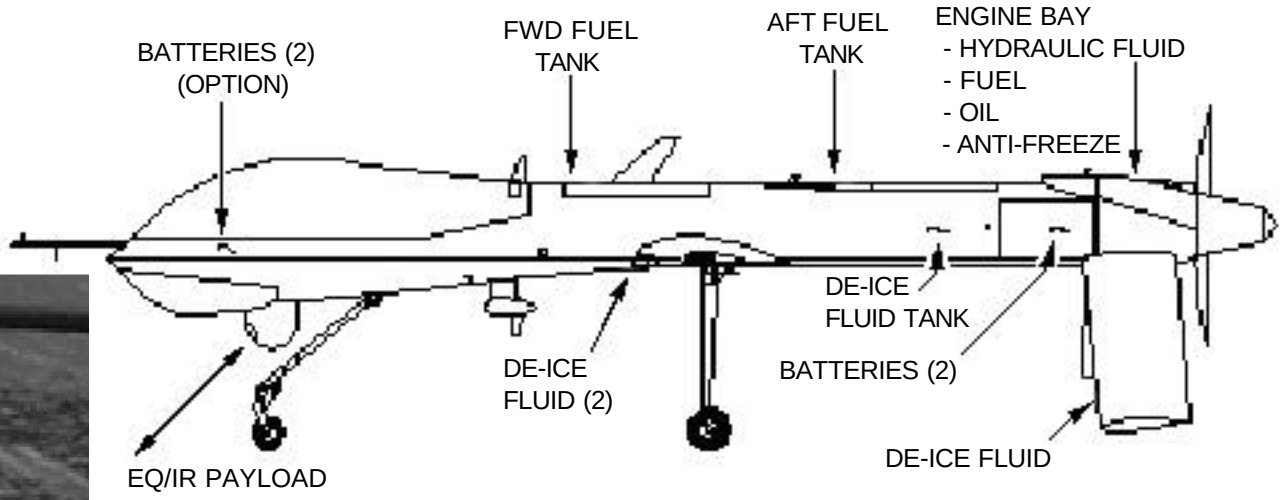
NOTE:
The UAV batteries (items 16 and 18), normally installed in the rear compartment of the aircraft, may be relocated to the nose area for CG purposes.

HAZARDOUS MATERIALS INVENTORY

1. HAZARDOUS MATERIALS INVENTORY

The Table lists the hazardous materials used on the UAV and the graphic defines the location of each material within the UAV. The airframe is comprised of numerous composite materials (e.g., Kevlar, carbon fibers, glass fibers and epoxy) none of which is considered hazardous in its cured state. However, precautions are required relative to handling of fractured composite materials and their combustion by-products.

SYSTEM, COMPONENT DESCRIPTION	GENERAL MATERIAL	SPECIFIC MATERIALS
EO/IR Payload	Lens Coating	Thorium Fluride
Batteries	Dry Cell	Nickel Cadmium (NiCad)
De-Ice Wings, Tails and Tank	Anti-Freeze	Ethylene Glycol
Engine Bay A. Hydraulic Fluid B. Fuel C. Oil D. Anti-Freeze	 Fluid Aviation Gasoline Lubricant Coolant	 Aeroshell Fluid 4 MIL-H-5606A Shell 100 LL TORCO Synthetic MPZ20/50 MOBIL 1 Formula 15/50 PRESTONE Anti-Freeze



FORWARD LOOKING INFARED (FLIR) POD
(REFER TO PAGE 3-11 FOR RADIOACTIVE
COATING HAZARDS)

UAV APPROACH, ENGINE AND BATTERY SHUTDOWN

1. UAV APPROACH

WARNING

Approach can be made from either side. Be sure to avoid the propeller area and use extreme caution when entering the forward missile firing areas.

a. Avoid the fuel powered propeller located at the aft section when engine is running.

b. The EO/IR sensor has three glass lenses and is located under the nose dome. Laser capability is established from the AN/AAS-52 payload. Call sign for laser equipped MQ-1 is Star 1, 2, etc. Fire protection must be informed when the laser is installed. A non laser UAV is identified with call sign Kodar 1, 2, etc.

c. The SAR antenna is located just forward of the EO/IR sensor, behind the chin fairing. The SAR antenna contains Byrellium. (See Chapter 3 hazard specifics and pages 7 and 8 for internal view of SAR.)

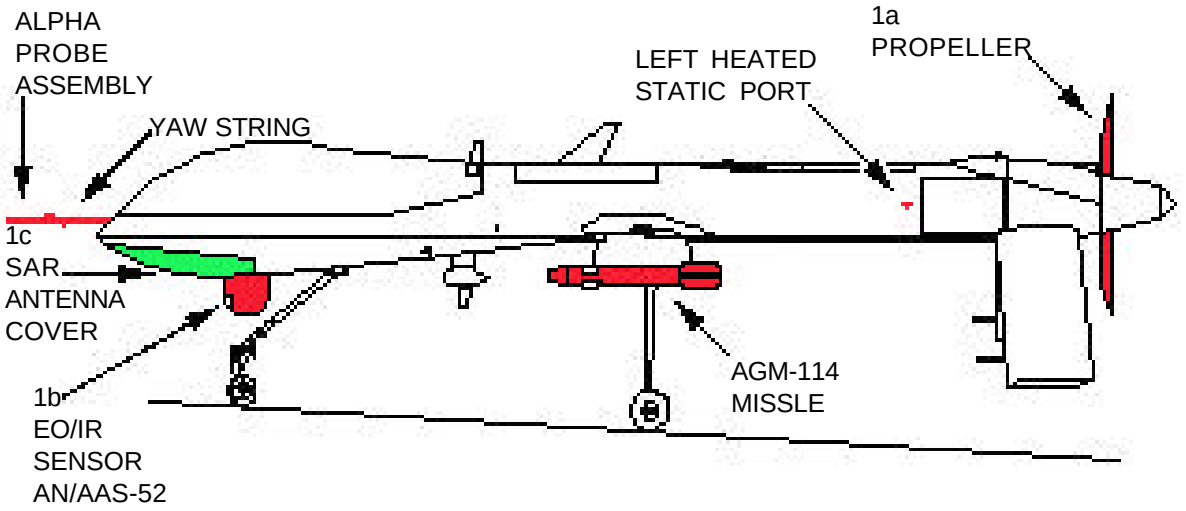
2. ENGINE SHUTDOWN

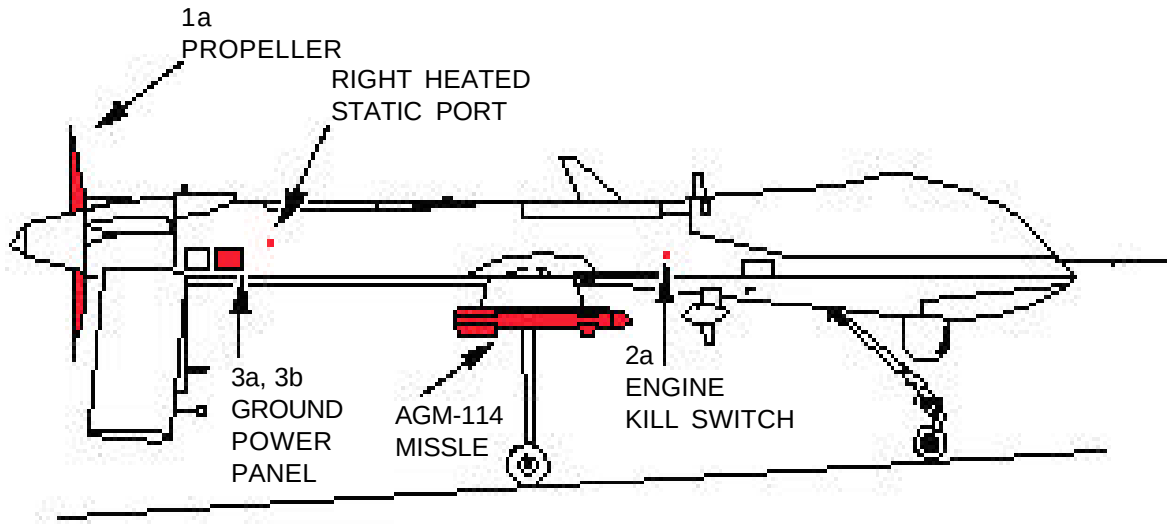
a. Use the engine kill switch, located on the right side forward of right main landing gear to shut the engine down. This is the only method for engine shutdown.

3. BATTERY SHUTDOWN

a. The battery switch is located inside aft right side of the fuselage near the tail section behind the ground power panel. The two batteries are nickle-cadium and capable of giving off possible toxic fumes.

b. Place the battery switch, inside the ground power panel area, in the OFF position to turn off all power to the UAV.





MQ-1 SYSTEM HAZARDS

1. AGM-114 MISSILE SYSTEM

The system consists of a modified RQ-1 Predator aircraft, resulting in the MQ-1 Hunter/Killer and components from an M-299 launcher (used on the AH-64 Apache helicopter), shipping containers, the Predator Ground Control Station (GCS), and the AN/AWM 101A launcher electronics tester. The production model of the MQ-1L evaluated for this study is further defined as “Block 5” by the government. The MQ-1L is a long endurance, medium altitude Unmanned Aerial Vehicle (UAV). The aircraft has the ability to incorporate different reconnaissance payloads. Aircraft control is provided via pilot commands from within a Ground Control Station (GCS). The GCS is enclosed in a portable shelter that incorporates workstations to enable the operators to control/monitor the MQ-1L and its sensor sub-systems and to exploit collected data. Control commands are up-linked from the GCS to the aircraft and reconnaissance imagery/aircraft status data is down linked via either C-Band Line-Of-Sight or Ku-Band Satellite links. The aircraft maximum gross weight is 2,250 pounds, with an empty weight of 1,680 pounds. It is powered by a standard commercial aircraft piston engine with a pusher propeller. The aircraft has an all-digital flight control system. The fuselage contains two bays, one forward and one aft, for payload and avionics. The graphite-epoxy composite airframe has 5-g capability at its take-off weight. The entire aircraft can be disassembled and transported within a single shipping container and can be reassembled in approximately eight hours by four trained personnel. The aircraft components consist of the fuselage, wings, tail surfaces, and landing gear. The fuselage contains the propulsion system, fuel system, and two payload/avionics bays.

2. PROPULSION SYSTEM

The engine is a Rotax 914 aircraft piston engine powering a variable pitch, two-blade composite pusher propeller. The engine uses airflow and standard automotive antifreeze for cooling, and 7.6 liters of automotive oil for lubrication.

3. INTERNAL BAYS

The MQ-1L possesses two internal bays within the fuselage to house equipment that adapts the platform for the AGM-114 function (payload) and also the necessary avionics required for continuous flight. The payload and avionics subsystems are distributed among the two bays.

MQ-1

NOTE:

The new variants of the RQ-1/MQ-1airframe are expanding into new mission capabilities. This new variant will have a wing span of 86 feet using higher altitudes (above 50,000 feet) and extended range (ER), for military and peace time use. The USAF designation Predator B-ER or MQ-9, named ALTAIR, will be for scientific, atmospheric research, surveillance, reconaissance, and other missions. In the near future, the US Navy, USCG, Homeland Defence and NASA will be using variants of the ER. NASA will use the name ALTUS for their variant.

MQ-1

MQ-1 SYSTEM HAZARDS-Continued

4. FUEL SYSTEM

The aircraft's fuel is contained in the forward and aft fuel tanks located in the fuselage. Each fuel tank consists of a rubberized fuel bladder supported by the fuselage structure. Each tank has its own filler neck, cap, and fuel level sensor located in a small access hatch on top of the fuselage over each tank. The filler caps provide atmospheric venting as well as a means for servicing the tanks. The aircraft's two fuel tanks have a total capacity of 600 pounds, but standard maximum fuel is 550 pounds. The DIN 51600, O-NORMC 1103 EURO-SUPER RON 95, and AVGAG 100 LL BLUE fuels used are standard 95 to 100-octane reciprocating aircraft engine fuels.

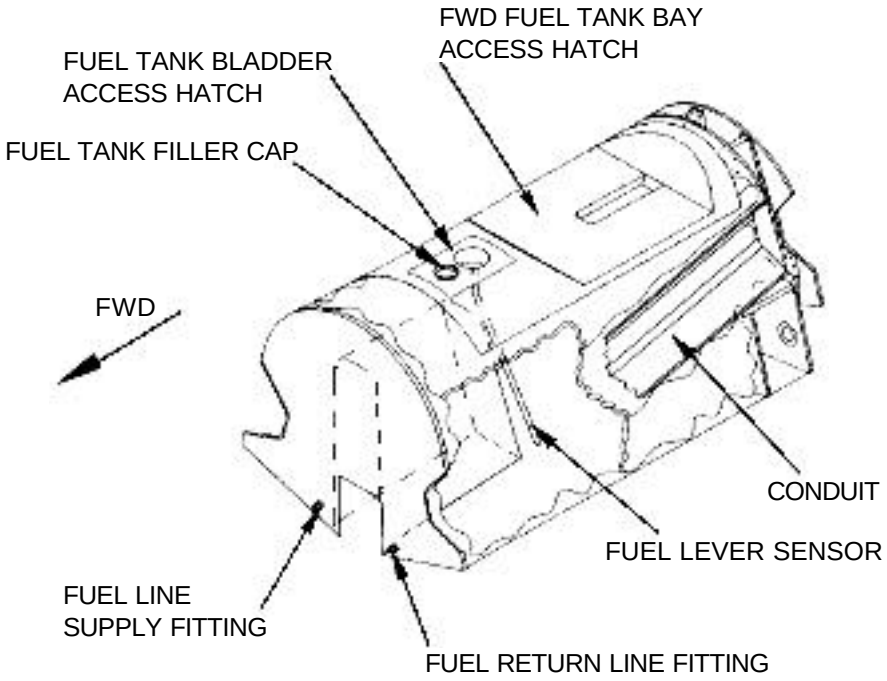
5. PAYLOAD

The mission essential payloads consist of laser designators, television, and infrared systems. The MQ-1L has the AN/AAS-52 installed in the forward bay. The AN/AAS-52 sensor is part of a family of sensors based on the Forward-Looking Infrared Laser Range Finder/Detector system. This payload also supports a laser illuminator. The AN/AAS-52 system operates in day/night/ adverse weather conditions to provide long-range surveillance, target acquisition, tracking, range finding, and laser designation for multiple laser-guided munitions.

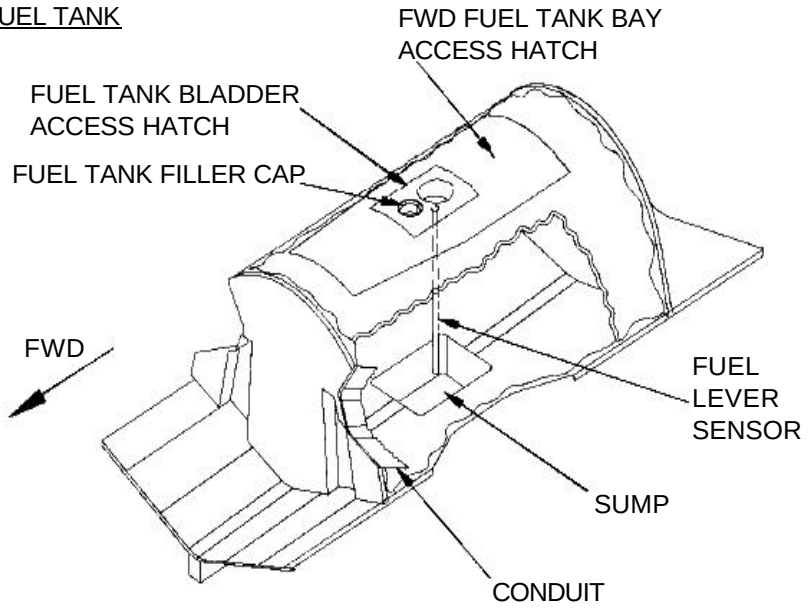
6. ELECTRICAL POWER SUBSYSTEM

The electrical power system for the aircraft includes a three Kilowatt starter/ alternator, a 28-volt direct current (DC) power supply, two 14 Amp-hour Ni-Cad battery pack (more battery packs can be added as mission requirements dictate), and the ground power panel. The alternator provides alternating current (AC) energy from the engine. This energy varies in proportion to engine speed. The AC energy from the alternator is supplied to the power converter. The power converter rectifies this power to render a stable 28-volt DC supply. This 28-volt power resides on the 28-volt bus and will be referred to as "+28 VDC". Battery power is used to augment/supply power in the event of engine/alternator failure. The battery packs are 13 centimeters (cm) x 15 cm x 30 cm and weighs approximately 8 pounds. It is comprised of two strings of rechargeable Ni-Cad dry cells. Battery energy is not used if the 28-volt bus remains above 28 volts. The batteries are intended as maintenance free and possess a lifecycle of approximately 500 charge/discharge cycles. The aircraft starter control connector that is located within the ground power panel must be plugged into the Starter/Ground Power Cart umbilical cord to be started. This electrical power connector provides ground electrical power so that use of onboard electrical power is not required.

FWD FUEL TANK



AFT FUEL TANK



MQ-1 SYSTEM LEVEL HAZARDS

1. MQ-1L SYSTEM LEVEL HAZARDS

Both the MQ-1L and AGM-114 weapon possess materials and components that present potential hazards to personnel during ground operations and pose collateral issues via unintended functions during flight.

a. Ground Hazards. The items that pose ground hazards consist of the engine fuel and batteries. In addition, the operating MQ-1L poses occupational hazards such as moving parts (propeller), high voltages, sharp edges, and falling weights.

b. Engine Fuel. Preparation for transport of the MQ-1L includes removal of residual fuel (to include “depuddling”). Atmospheric venting and fuel tank access during MQ-1L operations is provided via the filler caps.

c. Batteries. The MQ-1L utilizes Ni-Cad batteries to provide power when the engine alternator is not operating and at times when operational energy demands exceed the capacity of the engine alternator. This type of battery provides energy via chemical and not thermal means. When being transported, the batteries are in a discharged state and therefore pose no risk from an electrical perspective. Consequently, the medium used as a source of energy poses only a hazardous materials management concern when disposed of.

d. Occupational Hazards. Those occupational hazards that exist from accessible areas in and around the aircraft are managed via cautions/warnings within the Technical Orders that are issued to the field.

2. AGM-114 SYSTEM LEVEL HAZARDS

a. Ground Hazards. In addition to hazards posed by ordnance (rocket motor and warhead), the AGM-114 system also presents potential hazards due to the use of pressurized containers, EEDs, and a thermal battery.

b. AGM-114 Pressurized Containers. There are two pressurized containers within the AGM-114, the accumulator and the gyro.

(1) Accumulator. The accumulator vessel proof pressure is 13,200 psi and the vent pressure is 13,500 psi (established via failure of a burst disk) that is incorporated to prevent internal pressures from reaching the 22,000 psi tested burst point. The operating pressure of the accumulator is 8,000 psi nominal (initial fill pressure).

(2) Gyro. The gyro vessel proof pressure is 5,400 psi and the vent pressure is 3,600 psi (established via failure of a burst disk) that is incorporated to prevent internal pressures from reaching the 6,750 psi design burst point. The gyro vessel operating pressure is 3,000 psi.

c. AGM-114 Electro-explosive Devices (EED). All AGM-114 EEDs meet the requirements of MIL-I-23659, including the 1-amp/1-watt, five minute no-fire requirement and passing the 25 KV Electrostatic Discharge (ESD) test. AGM-114 EEDs exist as de-ice, gyro, accumulator, and battery initiation squibs. The de-ice, gyro, and accumulator squibs initiate piston actuators. The de-ice squib assembly resides external to the weapon and has been designed for and tested to demonstrate no ejection of mechanical parts. The gyro and accumulator EEDs reside within the weapon body and have been tested to show that no venting or ejecta exit the missile. The battery squib is completely contained when functioned.

d. AGM-114 Thermal Battery. The AGM-114 thermal battery is initiated by either of two 1-amp/1-watt, five-minute no-fire initiators. The stimuli used to fire these squibs is derived from the AEA “Missile Squib Fire” signal and is switched by the “Squib Arm” discrete signal. These signals are provided from the AEA as part of the launch sequence. The launch sequence occurs after AEA is commanded as “powered”, the missile is selected (powered), and “Arm” and ”Fire” commands have been received from the GCS via the MQ-1L PCM. Once squibbed, the thermal battery is active and can provide electrical stimulus for no more than 30 minutes. Testing has also shown that the maximum skin temperature reached by the battery, even in a no-load condition, is 575°F. Analysis has shown that this may cause the accumulator to be heated enough to fail the burst disk, allowing the gas to vent through the control section, but will not cause ignition of the warhead or rocket motor. In addition, no inadvertent thermal battery ignition has occurred in over 175 LAT missiles launched, or missile handling and operation. Thus no safety related failures are expected from the thermal battery.

3. INADVERTENT ROCKET MOTOR INITIATION (MISSILE LAUNCH)

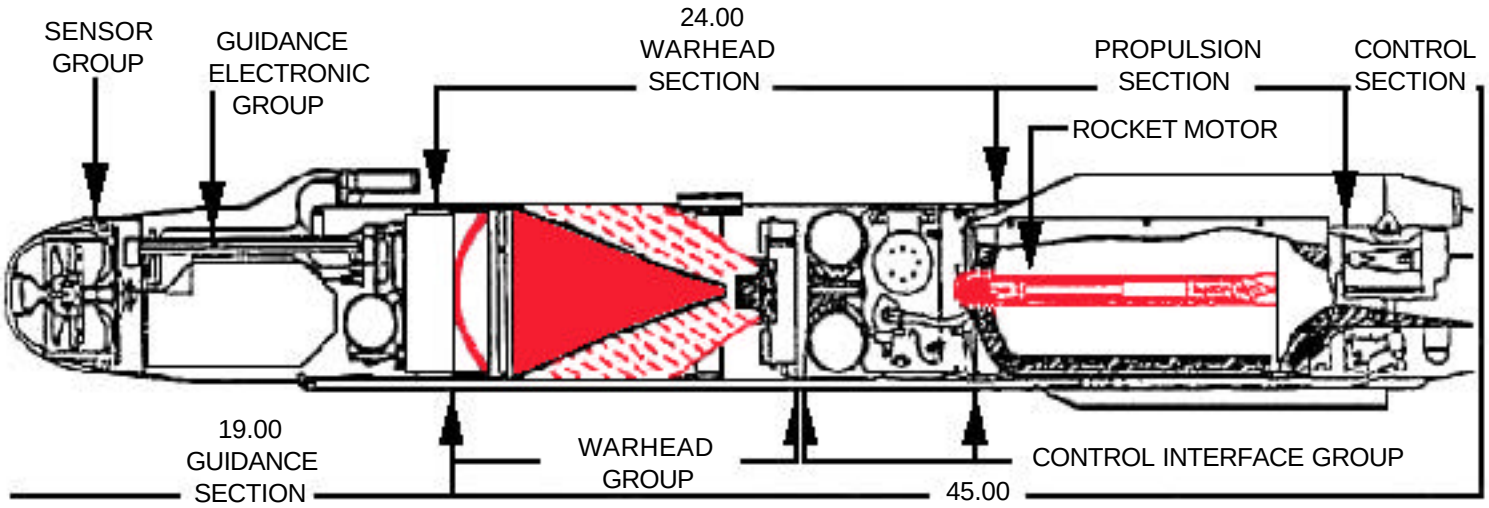
a. An inadvertent rocket motor initiation event poses the potential for loss of life to personnel on the ground as well as a potential loss of asset and/or collateral damage during airborne operations. The stimuli required by the AGM-114 to initiate its rocket motor is intended to be supplied only as a consequence of an ordered set of sequential events via a distributed system. This system consists of the GCS, MQ-1L, and AEA. The aggregate of hardware/software/protocol of these three subsystems and specific ground-based management techniques constitutes the distributed system safety.

UAV MUNITIONS

1. AGM-114K-2 MISSILE AND WARHEAD SUBSYSTEM

The AGM-114 missiles are laser-guided rocket propelled anti-armor and anti-material weapons developed by the U.S. Army to be deployed from a helicopter. The AGM-114K-2 configuration employs a dual shaped charge warhead system. A precursor warhead first defeats reactive armor, then the main warhead is functioned to defeat the remaining armor. The AGM-114M configured weapon employs a Blast-Fragmentation (blast-frag) warhead. The blast-frag warhead is designed to separate from the missile upon impact and penetrate the target before detonating. Both missiles consist of a Guidance Section, Warhead Section, Propulsion Section and Control Section. The explosive is two zirconium sponge incendiary charges. The colorized area with broken lines consists of zirconium particles with calcium stearate flakes.

AGM-114 MISSILE



AGM-114 K-2 MISSILE CONFIGURATION

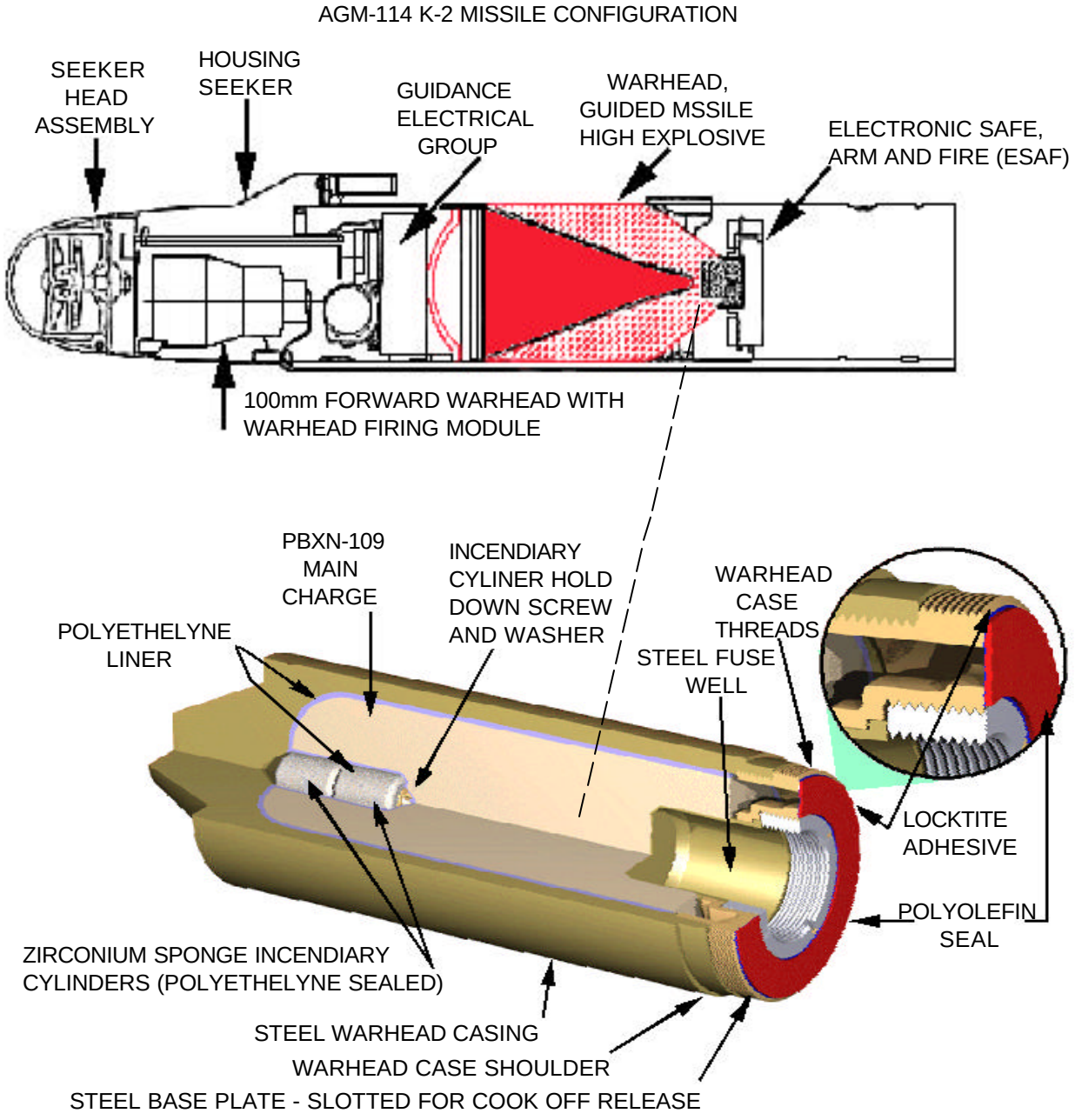
UAV MUNITIONS-Continued

2. AGM-114K-2 CONFIGURATION

The warhead function sequence is initiated when either crush switch (or back-up g-switch) located in the front of the weapon is closed. Upon receipt of this indication, the ESAF processor sends a trigger signal to the FWFM initiating the precursor warhead to defeat the reactive armor. The ESAF processor then sends a trigger signal to the Main Module after a preprogrammed factory delay ("Fuze Data" from the guidance section) causing its output to the main warhead to occur after the precursor warhead has had the opportunity to perform its task. This staging of functions allows the main warhead to defeat the main armor.

3. AGM-114K-2 HAZARD CLASSIFICATION

The classification for the AGM-114K-2 missile is listed below:
DOD Class/Division/SCG – 1.1E
DOT Label: Explosive 1.1E
DOT Proper Shipping Name: ROCKETS
UN Serial Number 0181



UAV MUNITIONS-Continued

4. AGM-114M WARHEAD

The blast-frag warhead is installed in the warhead section in place of the main warhead for the K-2 missile. The precursor warhead is also removed. The blast frag warhead consists of a warhead body, 2.511 Kg PBXN-109 explosive fill, two zirconium sponge incendiary charges, and the fuze well and aft closure components. Two incendiary cylinders are bolted with a stainless steel bolt to the front inside of the steel case. These cylinders (111 grams each) are pressed sifted zirconium metal particles with calcium stearate flakes. The steel warhead casing with incendiary cylinders installed is coated internally with AC 5120 Polyethylene. The PBXN-109 explosive is cast into the case over the incendiary cylinders. A slotted base plate is screwed onto the aft end of the warhead case to allow attachment of the fuze well and Time Delay Fuze Assembly (TDFA). A polyolefin seal seals the slots. An 18-gram PBXN-5 booster pellet is placed between the fuze and inside of the fuze well.

5. AGM-114M CONFIGURATION

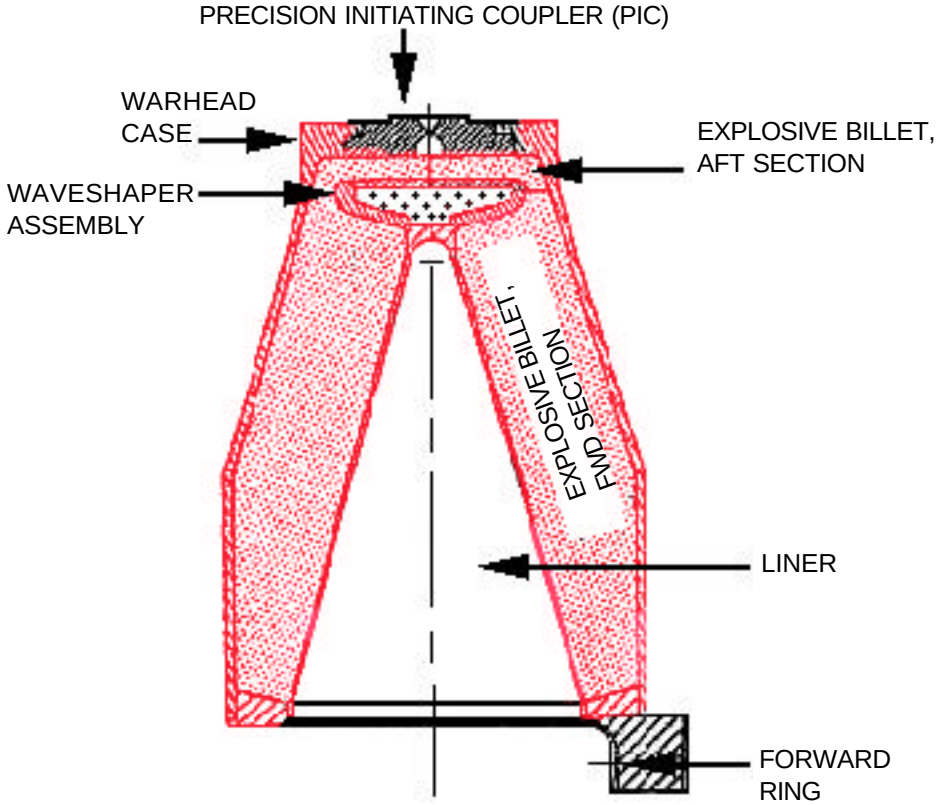
The warhead function sequence is initiated when either crush switch located in the guidance section is closed. Upon receipt of this indication, the time delay CCA in the TDFA provides a delay to allow time for the blast-frag warhead to pass through any barrier before providing an output to the blast-frag warhead. The warhead function consists of blast energy from the war- head main fill coupled with initiation of in- cendiary cylinders in the front of the warhead and case fragmentation.

6. AGM-114M HAZARD CLASSIFICATION

The interim classification for the AGM-114M missile is listed below. The final hazard classification is in Tri-Service coordination:

DOD Class/Division/SCG – 1.1E
DOT Label: Explosive 1.1E
DOT Proper Shipping Name: ROCKETS
UN Serial Number 0181

PRECURSER WARHEAD ASSEMBLY



MAIN WARHEAD ASSEMBLY